



U.S. Department of Energy  
Energy Efficiency and Renewable Energy

# ASHRAE Standard 90.1-1999



## The Top Ten Issues You Should Know About The New Energy Standard

*presented by Rob De Boer*



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## Purpose of Standard 90.1 - 1999

**The purpose of this standard is to provide minimum requirements for the energy-efficient design of buildings, except low-rise residential buildings.**



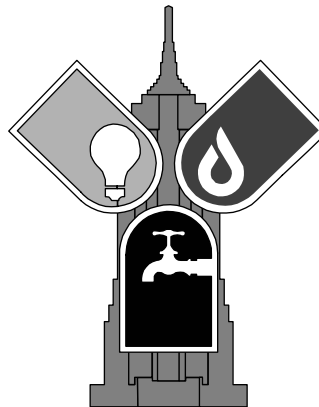
## Number 10:

◆ 90.1 applies to the entire building



# 10 - 90.1 applies to the *entire BUILDING*

- Envelope
- HVAC
- Service water heating
- Power
- Lighting
- Electric motors





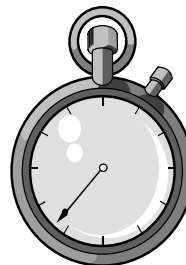
## Number 9:

### ◆ Control requirements for systems larger than 65,000 Btuh and 3/4 HP fans



## # 9 - Off-Hour Controls > 65,000 Btuh and 3/4 hp

- Automatic Shutdown
  - Automatic time clock w/10 hour battery back up
  - occupancy sensor
  - manually operated timer w/max. 2 hr duration
  - Security system interlock
- Setback, except radiant
- Optimum start > 10,000 cfm





## **# 9 - Off-Hour Controls > 65,000 Btuh and 3/4 hp**

- **Automated outdoor air supply and exhaust shut-off damper controls**
- **Zone isolation**
  - 25,000 square feet maximum zone size on one floor
  - Shut off airflow
  - Central systems capable of stable operation



## **Number 8:**

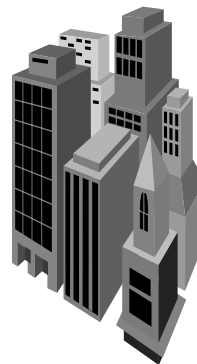
- ◆ **Lighting power densities are decreased for most applications**
- ◆ **There are also lighting control requirements**



## # 8 - Lighting Requirements

### Building area lighting power densities

<u>Building type</u>	<u>W/ft<sup>2</sup></u>
Hospital	1.6
Library	1.5
Manufacturing	2.2
Museum	1.6
Office	1.3
Retail	1.9



## # 8 - Lighting Requirements

### Space-by-space method (W/ft<sup>2</sup>)

Office Enclosed	1.5	Dining	1.4
Office Open	1.3	Food Prep	2.2
Conference	1.5	Corridor	0.7
Training	1.6	Restroom	1.0
Lounge	1.4	Active Storage	1.1
Lobby	1.8		

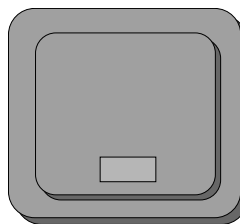
*Power may be traded between spaces*



## Lighting Requirements

### Interior control requirements

- At least one control in each space
- Automatic shutoff for *buildings* > 5,000 ft<sup>2</sup>



## Number 7:

- Applies to alterations and additions



## **# 7 - Applies to Alterations and Additions**

- **Individual components comply with requirements**
- **Multiple components:**
  - *Annual energy use  $\leq$  compliant design*



## **Number 6:**

- **Hot gas bypass is limited - for both split systems and chillers**



## # 6 - Hot Gas Bypass Limitation

- > 7.5 tons
- Multiple steps or continuous unloading

Rated Capacity	Max Hot Gas Bypass (% of Total Capacity)
$\leq 240,000$ Btu/h (70 kW)	50%
> 240,000 Btu/h (70 kW)	25%



## Number 5:

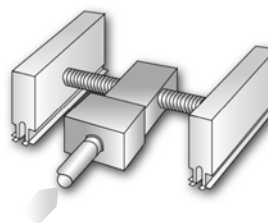
- Limitation on the amount of reheat that can be done with new energy





## Simultaneous Heating and Cooling - Exceptions

- **Airflow limits. The larger of**
  - Standard 62 zone requirements, or...
  - 0.4 cfm/ft<sup>2</sup>, or...
  - 30% of supply air
  - 300 cfm, or...
  - Standard 62, 6-1 implementation
- **75% of reheat energy from site recovered or site solar**



## Simultaneous Heating and Cooling - Dehumidification

- **Exceptions**
  - Reducing supply air flow to 50%, or min. ventilation
  - Systems under 6.67 tons that can unload at least 50%
  - Systems smaller than 3.3 tons
  - Systems with specific humidity requirements (museums, surgical)
  - 75% of reheat or recool energy is recovered or solar



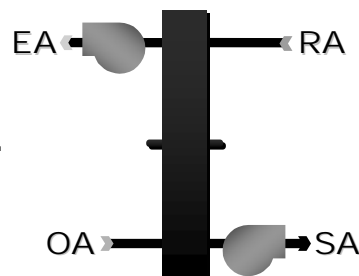
## Number 4:

- ◆ Energy recovery is required for airside and waterside in specific applications



### 4a Energy Recovery - Airside

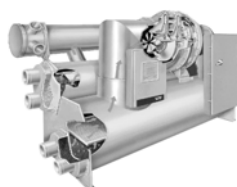
- Required when 70% OA and 5000 cfm total
  - 50% effectiveness
- Exceptions
  - Labs, toxic exhaust, etc.
  - Largest Exhaust < 75% outside air





## 4b Energy Recovery - Waterside

- Service Water Heating
  - 24 hrs per day and
  - Heat rejection > 6 MMBtuh and
  - Design SWH load > 1 MMBtuh
- Heat recovery required (smaller of)
  - 60% of design heat rejection
  - Preheat water to 85°F

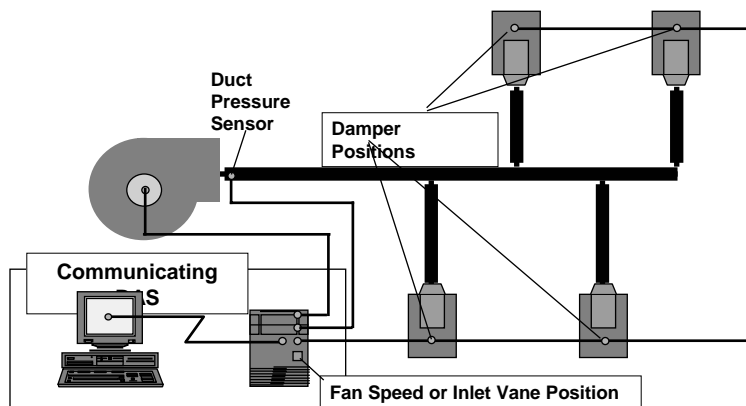


## Number 3:

- Fan pressure optimization is required for DDC/VAV systems



## # 3 - Fan Pressure Optimization Required for DDC/VAV Systems



## Number 2:

- **Minimum efficiency requirements have been revised for many types of HVAC equipment**



## # 2 - Equipment Efficiency Examples

Type	Efficiency
• 20-100 ton self-contained	11.0 EER* 10.3 IPLV*
• 1.5 - 5.25 ton water-source heat pump	12.0 EER (cooling) 4.2 COP (heating)
• ≥300-ton water-cooled <i>centrifugal</i> chiller (ARI Standard conditions)	6.10 COP 0.576 6.40 IPLV0.549 IPLV

Note: Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat.

**Both full and part load efficiencies are required**



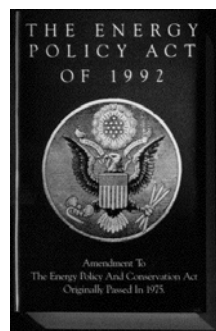
## Number 1:

- **90.1 is the basis of the State of Michigan's energy code**



## # 1 - 90.1 is the basis for Michigan EPA Energy Act

- States must meet or exceed the requirements of Standard 90.1-1989
- U.S. DOE must evaluate any revisions to 90.1
- DOE can then obligate states to update their codes



## 90.1 and LEED™

- LEED (Leadership in Energy & Environmental Design)
- 90.1-1999 (or local energy code) is prerequisite
- So, if the building is to be LEED certified at any level, 90.1 is the minimum



# Questions?

